AUSTRALIAN ACANTHOCEPHALA, No. 6

By T. HARVEY JOHNSTON and S. J. EDMONDS, University of Adelaide.

Fig. 1–30.

The earlier papers in this series have been published in the *Transactions of the Royal Society of South Australia* (1929–1947). For assistance in regard to material we are indebted to the late Dr. T. L. Bancroft, of Eidsvold, Queensland; and to Professor J. B. Cleland, of the University of Adelaide.

The three species dealt with have been taken from birds. One, from *Alectura lathami,* is described as new; one, from *Charadrius cucullatus,* is attributed to a Japanese species; and the third, from a gull, *Larus novaehollandiae,* is assigned to a species previously known from South America.

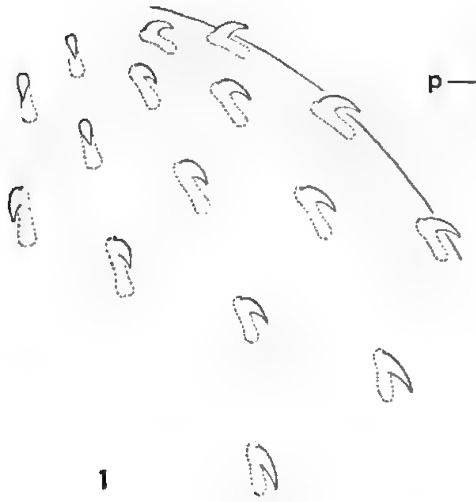
Type material has been deposited in the South Australian Museum, Adelaide.

FILICOLLIS SPHAEROCEPHALUS (Bremser 1819) Travassos 1926.

Fig. 1–10.

Specimens of this echinorhynch were obtained from the intestine of the sea-gull, *Larus novaehollandiae* at Henley Beach, South Australia. The collection consists of a few mature and a large number of nearly mature worms. All the measurements given below, except where otherwise stated, were made on specimens preserved in formalin and cleared in methyl salicylate.

The worms are long and cylindrical with a constriction towards the anterior end. The length of the males ranges from 10–21 mm. (average 17 mm.), and that of the females from 9–22 mm. (average 18·5 mm.). The maximum width of the male is from 1·1 to 2·2 mm. (average 1·7 mm.), and that of the female 0·9 to 2·3 mm. (average 1·9 mm.). The proboscis is spherical to oblate in shape and when collected was firmly embedded in the intestinal wall of the host. Its diameter in the widest part ranges from 0·7 to 1·9 mm. The proboscis is armed with 19–21 longitudinal rows, each of 7–8 hooks, all of which are firmly attached by rooting processes. The arrangement and size of the hooks are shown in fig. 1–4. The proboscis is attached to the body by a long slender, retractile stalk or neck which measures up to 3·0 mm. long. The receptaculum is double-walled, is from 3·2 to 6·7 mm. long, and in the case of the male is connected with the testes. In most specimens minute spines are found on the anterior portion of the body. The two lemnisci measure from 2·0 to 4·8 mm. in length.



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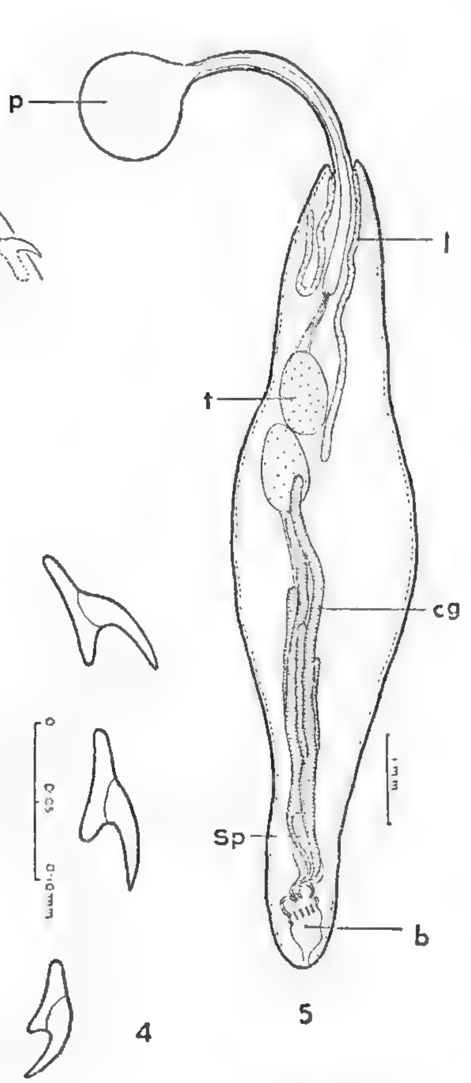

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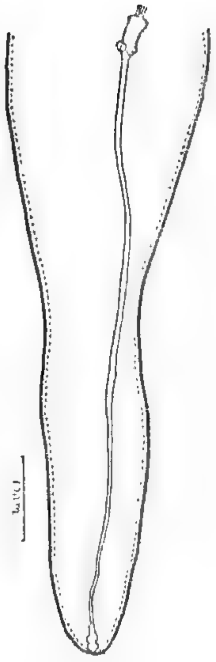

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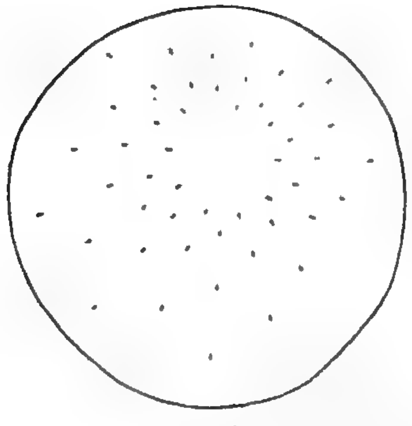

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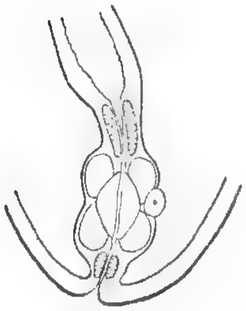

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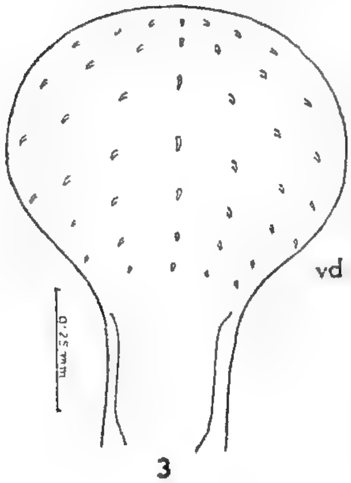

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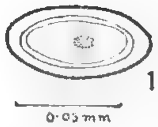

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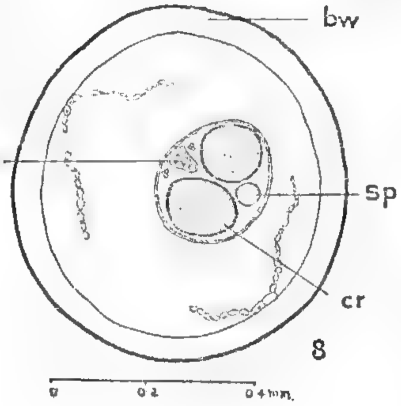

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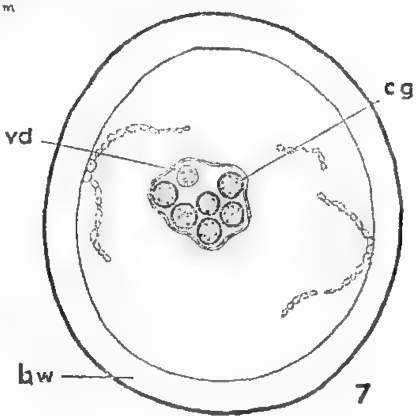

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Male System. Two ovoid testes, 0·8 to 1·8 mm. in length and 0·5 to 0·9 mm. in width, are situated in the anterior half of the worm. Six long tubular cement glands which are pressed closely together, arise near the posterior testis in most cases. The two cement ducts are swollen basally to form two cement reservoirs. The vas deferens is distended at its posterior part to form a seminal vesicle. There is a well developed penis. Saefftigen's pouch is club-shaped and the bursa bears a number of rays.

Female System. The structure and arrangement of the female reproductive systems are shown in fig. 6, 9. The uterus proper is long, being usually about half the body length. Ripe eggs, measured in 70 p.c. alcohol, are 62–66μ by 30–37μ, and are without polar prolongations.

Systematic Position. Our specimens agree closely in most details with the account of *F. sphaerocephalus* (Bremser) published by Travassos (1926, 91) but there is a difference regarding the number and arrangement of the proboscis hooks. Bremser reported that there were 26–28 longitudinal rows, each with 10–14 hooks. Marval (1905, 322) mentioned 26–28 rows, each with 12–14 hooks. Travassos (1926) stated that there were 23 rows, each with 10 hooks. Meyer (1932, 76) published a summarized account of the species. Our specimens possess 19–21 longitudinal rows, each with 7–8 hooks but in spite of this difference, we have decided to assign them to *F. sphaerocephalus* which is known from *Larus dominicanus* and some other birds from South America. A variation in the number and arrangement of the proboscis hooks has been indicated by Perry (1942) in her account of *F. altmani* which has 25–30 (28) rows each with 9–12 (11) hooks.

EMPODIUS ALECTURAE n. sp.

Fig. 11–24.

A number of parasites of this species were collected by the late Dr. T. L. Bancroft from the intestine of *Alectura lathami* from Eidsvold, Burnett River, Queensland. All the specimens are long and flattened or cylindrical, and show well-marked pseudo-segmentation. The smallest specimen is 11 mm. long, 0·58 mm. wide, and white in colour. Most of the adult forms are pale yellow

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Fig. 1–10, *Filicollis sphaerocephalus.* 1. portion of proboscis; 2. arrangement of proboscis hooks; 3. proboscis of young male; 4. three posterior proboscis hooks from a large male; 5. male specimen; 6. posterior portion of female; 7. T.S. male showing 6 cement glands; 8. T.S. male in region of cement reservoir; 9. genital complex of female; 10. mature egg.

References to lettering: b. bursa; br. brain; bw. body wall; cg. cement gland; cr. cement reservoir; l. lemnisci; la. lacunar system; lm. longitudinal muscle; lp. lateral uterine pouch; m. muscle fibres; p. proboscis; ps. proboscis sheath; rm. retractor muscle; so. swimming ovaries; Sp. Saefftigen's pouch; sph. sphincter; t. testis; u. uterus; ub. uterine bell; vd. vas deferens; vs. vesicula seminalis.

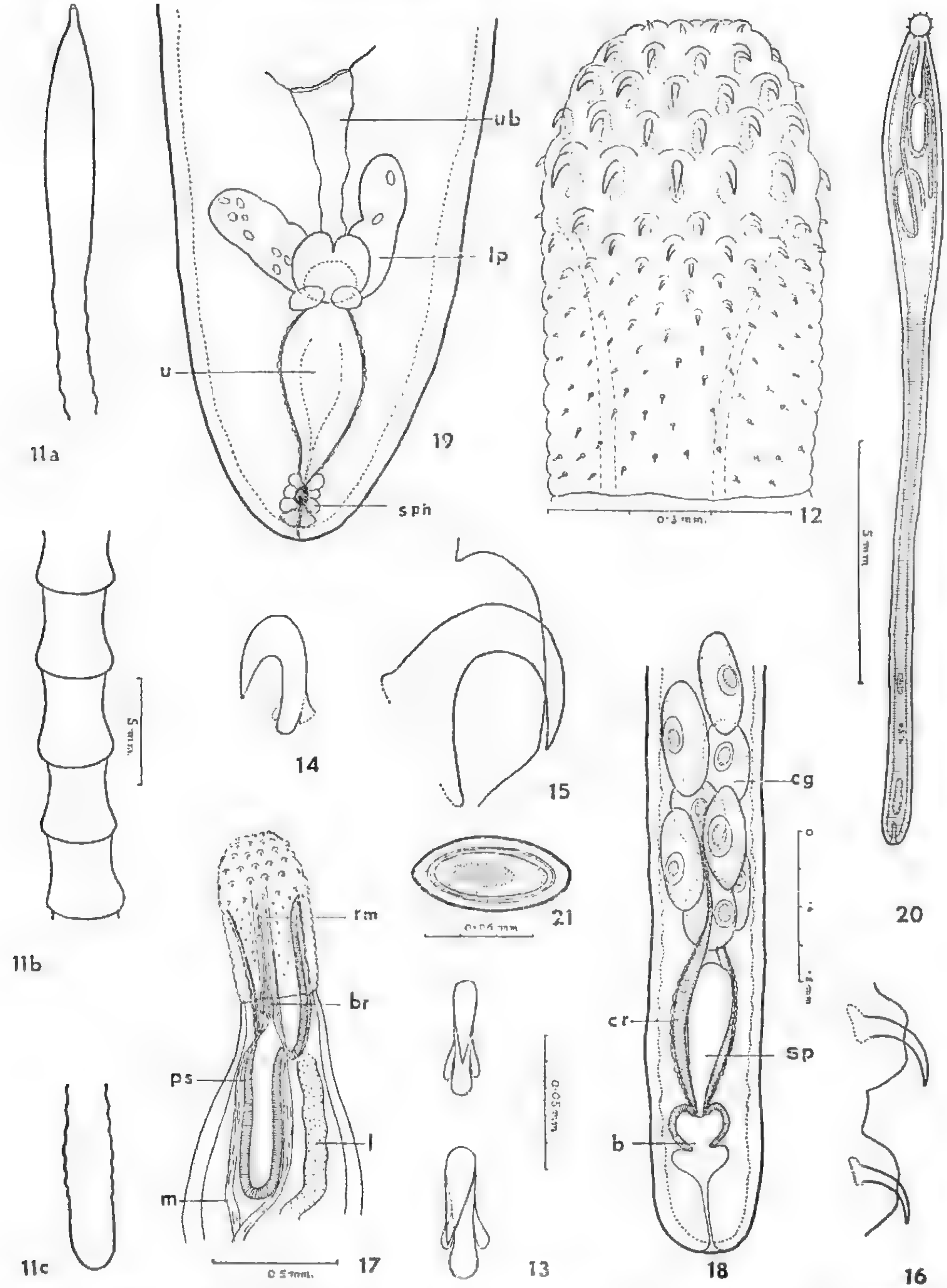

Fig. 11–21, *Empodius alecturae.* 11. (a) anterior region, (b) mid-region, (c) posterior region of female, all drawn to same scale; 12. proboscis; 13. anterior hooks from adult (rows 1 and 2); 14. anterior hooks from adult (row 3); 15. anterior hooks from adult (row 5); 16. hooks from posterior part of proboscis; 17. anterior part of male; 18. posterior region of male; 19. posterior region of female; 20. young male; 21 egg. (Fig. 13–16 to same scale.)

or straw coloured. The largest male is 170 mm. long and 1·0 mm. wide in the broadest part; it consists of about 200 "segments," while most of the females are about 230 mm. long and 1·4 mm. wide near the middle of the worm where the breadth is greatest. The collection also contains two very large females, each of about 280 segments, one measuring 65 cm. long and 3·9 mm. wide and the other 58 cm. long and 3·6 mm. wide. The specimens are probably the longest of all known echinorhynchs.

The proboscis is cylindrical and small when compared with the size of the worm. Its maximum dimensions are: male, length 0·52 mm., breadth 0·31 mm.; and female, length 0·73 mm., breadth 0·42 mm. It is armed with numerous hooks which fall into two groups. The anterior third of the proboscis is beset with 12 spiral rows of 5 hooks each and the posterior two-thirds with 12 spiral rows of 14–16 smaller hooks which are spiniform and less regularly placed near the neck region. Most of the hooks bear rooting processes, the shape of which we have not been able to determine satisfactorily. In the case of the anterior hooks it seems to be a three-pronged process (fig. 13 and 14). All the hooks arise from a slight swelling of the epidermis (fig. 15 and 16). The body of both sexes is smooth. The region of the animal immediately behind the proboscis is slightly swollen and contains the receptaculum and lemnisci. The pseudo-segmentation in this region in both sexes and in the posterior portion of the male is not very well marked externally. The proboscis receptaculum consists of two parts, an anterior portion which arises at the junction of the two groups of proboscis hooks and which is very thin ventrally (fig. 17), and a posterior sac-like portion with a single thick continuous wall (fig. 24). Muscle fibres pass from within the proboscis to enter the body cavity of the parasite at the junction of these two parts of the receptaculum. A similar type of proboscis sheath has been described by Meyer (1932, 181) in the case of *Empodius otidis* (Miescher). An oval brain is situated ventrally in the anterior portion of the proboscis. The lemnisci are much larger than the receptaculum. The lacunar system is well developed and consists of one long channel from which arise transversely, smaller circular collecting vessels.

Male System. Two elongate elliptical testes of approximately equal size are situated well towards the posterior part of the worm and their maximum dimensions are: length 2·5 mm., and breadth 0·65 mm. Eight elliptical cement glands, although closely pressed together, appear to be arranged in four pairs. There are two narrow cement ducts and a pyriform Saefftigen's pouch. The male opening is terminal.

Female System. The female complex is small in comparison with the size of the animal. Its structure is shown in fig. 19. The typical uterine bell of an echinorhynch seems to be either collapsed or lacking in most of our female specimens. A structure of very thin tissue which possibly acts as a uterine bell,

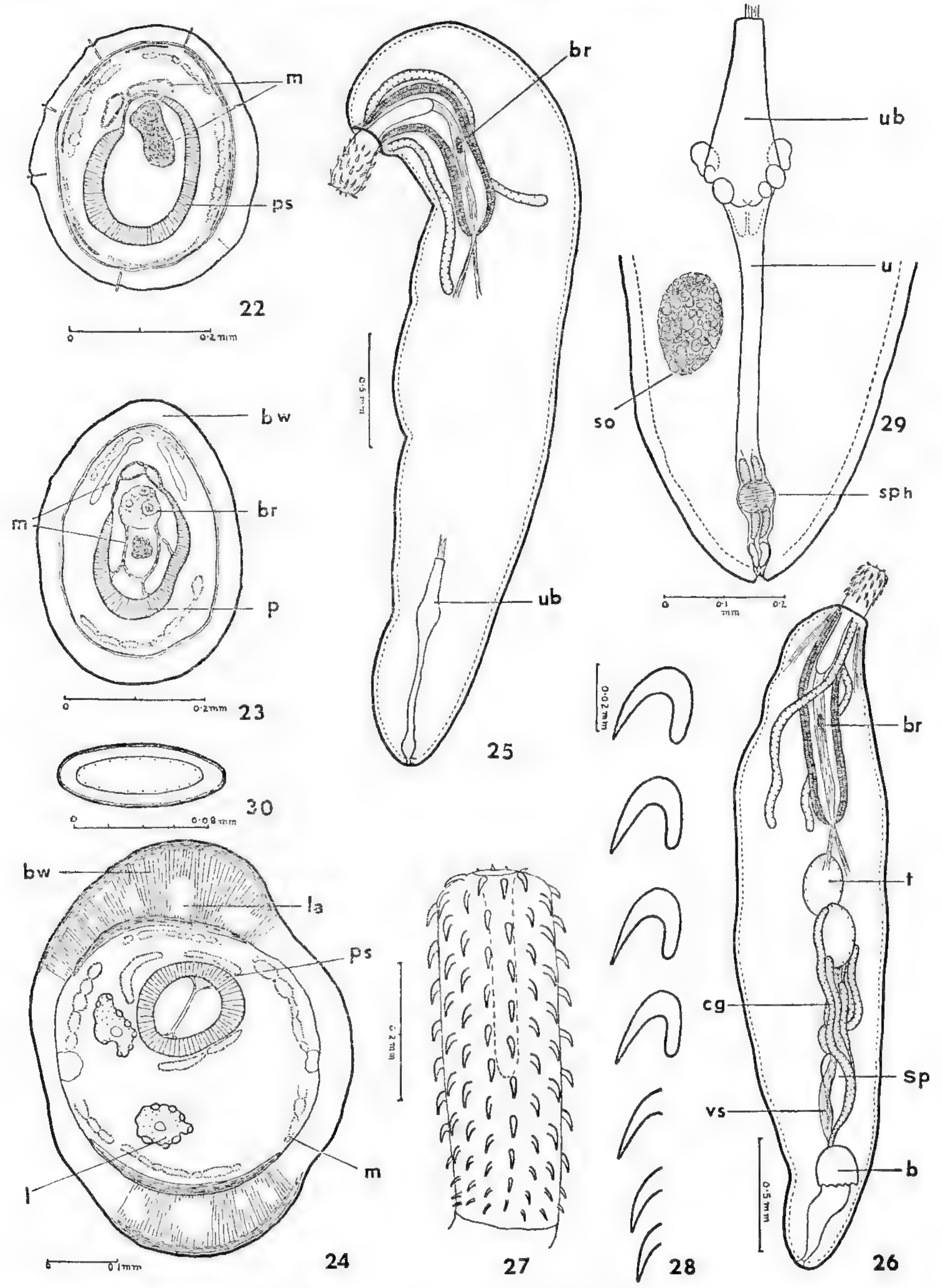

Fig. 22–24, *Empodius alecturae*. 22. T.S. anterior region of proboscis; 23. T.S. proboscis through brain; 24. T.S. anterior part of body.

Fig. 25–30, *Prosthorhynchus charadrii*. 25. young female; 26. young male; 27. proboscis (partly invaginated); 28. proboscis hooks; 29. female complex; 30. immature egg.

can be made out in a few of the worms. Two well developed lateral uterine pouches, in most cases containing eggs, come off laterally from the anterior end of the female complex and project towards the anterior end of the worm. The uterus is short and stout, its maximum dimensions being, length 0·92 mm. and breadth 0·45 mm. The female aperture is terminal. Ripe eggs are from 88 to 93μ long and from 40 to 43μ wide and are without polar prolongations (fig. 21).

Systematic Position. This parasite is considered to be a new species of the genus *Empodius*, family Gigantorhynchidae. It shows many resemblances to *E. taeniatus* (von Linstow 1901), but differs from the latter in length, in the number and arrangement of the proboscis hooks, and in the size of the egg.

PROSTHORHYNCHUS CHARADRII Yamaguti 1939.

Fig. 25–30.

A number of male and females of an echinorhynch, which we consider to be juvenile specimens of the above species, were found in the intestine of the bird, *Charadrius cucullatus*, collected by Prof. J. B. Cleland at Waitpinga, South Australia. The animals are small and cylindrical and the larger females in most cases are curved ventrally towards the posterior extremity. The body of both sexes is devoid of spines. The length of the males ranges from 1·8 to 3·2 mm., and the maximum width 0·50 to 0·66 mm. The length of the females ranges from 2·3 to 5·4 mm. and the width from 0·58 to 0·80 mm., all these measurements being made on specimens cleared in methyl salicylate. The proboscis, which is invaginated in all our specimens, is cylindrical and is borne at a slight angle to the rest of the body. Its maximum width ranges from 0·14 to 0·19 mm. and when fully everted, would be about 0·6 to 0·8 mm. long. The proboscis is armed with 17 longitudinal rows each of about 17 hooks, all of which, except the posterior three, have strong rooting processes. Their shape and size is shown in fig. 28. There is a short neck without hooks. The proboscis sheath is cylindrical and measures from 0·6 to 1·2 mm. in length and from 0·15 to 0·21 mm. in width. The sheath is double-walled and an elliptical brain is situated near its middle. There are two slender lemnisci which in most cases extend as far as the posterior end of the proboscis sheath.

Male System. Two elliptical testes are situated in the mid-region of the worm. They lie close together and are of approximately equal size, their length ranging from 0·16 to 0·25 mm. and their width from 0·12 to 0·17 mm. There are six long slender cement glands which are pressed together. Two of the glands reach as far forward as the anterior testes. Saefftigen's pouch is pyriform; there is a bursal cap; and the male aperture is terminal.

Female Complex. The shape and structure of the female apparatus are indicated in fig. 29. There is a well developed uterine bell, up to 0·36 mm. in length; a thin uterus, 0·5 mm. long; and a single-bulbed vaginal sphincter 0·15 mm. long. All our specimens are young, and though most of them contain swimming ovaries, none has ripe eggs. The youngest worms show that the ovarian balls arise near the base of the proboscis. The largest swimming ovary measured 0·19 × 0·12 mm., and the largest 93μ × 33μ. The posterior end of many females is slightly invaginated, the vaginal sphincter connecting with the anterior end of the invagination.

Systematic Position. We consider our specimens to be juveniles of *Prosthorhynchus charadrii* Yamaguti (1934, 334). The size of the proboscis, the number and arrangement of its hooks, and the general organization resemble those of the Japanese species which was collected from *Charadrius dubius curonicus* Gmelin. There is, however, a slight difference regarding some of the hooks. In Yamaguti's specimens all hooks except the posterior four in each row have rooting processes, whereas in ours all hooks except the posterior three in each row possess them. Yamaguti reported that the vaginal sphincter consisted of a double bulb, whereas in our material the structure is single-bulbed, but this condition may be due to immaturity.

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LARVAL TREMATODES FROM AUSTRALIAN FRESHWATER MOLLUSCS, PART XI

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Summary

Earlier papers in this series have been published in the Transactions of the Royal Society of South Australia, 1937-1945. The present contribution deals with the morphology of the cercaria and metacercarcia, obtained experimentally, of two Strigeate trematodes, as yet unrecognized as adults. The cercariae were obtained from gastropods living in the swamps of the lower Murray River, South Australia. These are: (1) Cercaria lessoni n. sp., from Planorbis isingi Cotton, Limnaea lessoni Deshayes, and Simlimnea subaquatilis Tate; the metacercarial stage occurring in freshwater leeches, Glossiphonia spp.; the adult being probably an Apatemon. (2) Cercaria ameriannae n. sp. from Amerianna pectorosa Conrad; the metacercaria occuring in tadpoles of Limnodynastes sp. (experimental) and, precociously, in Amerianna pectorosa; the unrecognized adult being a Diplostome, perhaps a Tylodelphys.